

EMSP STUDENT RESEARCH

One goal of the EMSP is to serve as a stimulus to focus the nation's science infrastructure on critical national environmental management problems. One of the primary ways to accomplish this goal is to increase the cadre of scientific expertise available to focus on EM problems. By making opportunities available for Post Doctoral, Ph.D., Masters, and Undergraduate research on EMSP projects, the program achieves this goal. EMSP currently supports the following number of student researchers:

103 Undergraduate Researchers
 260 Master Researchers
 69 Ph.D. Researchers
 184 Post Doctoral Researchers.

The tables below describe the EMSP's accomplishments in the area of undergraduate, graduate, and post-graduate research support as reported in project annual and final reports.

DEACTIVATION AND DECOMMISSIONING

Biogeochemistry

| <i>Project Number & Title</i> | <i>Undergrads</i> | <i>Masters</i> | <i>Ph.D.s</i> | <i>Post Docs</i> |
|---|-------------------|----------------|---------------|------------------|
| 64931 - Microbially Promoting Solubilization of Steel Corrosion Products and Fate of Associated Actinides | 0 | 1 | 0 | 2 |

Engineering Science

| <i>Project Number & Title</i> | <i>Undergrads</i> | <i>Masters</i> | <i>Ph.D.s</i> | <i>Post Docs</i> |
|---|-------------------|----------------|---------------|------------------|
| 55052 - Advanced Sensing and Control Techniques to Facilitate Semi-Autonomous Decommissioning | 0 | 2 | 4 | 0 |

Inorganic Chemistry

| <i>Project Number & Title</i> | <i>Undergrads</i> | <i>Masters</i> | <i>Ph.D.s</i> | <i>Post Docs</i> |
|---|-------------------|----------------|---------------|------------------|
| 54724 - Synthesis of New Water-Soluble Metal-Binding Polymers: Combinatorial Chemistry Approach | 0 | 2 | 0 | 0 |

Materials Science

| <i>Project Number & Title</i> | <i>Undergrads</i> | <i>Masters</i> | <i>Ph.D.s</i> | <i>Post Docs</i> |
|---|-------------------|----------------|---------------|------------------|
| 55380 - In-Situ Spectro-Electrochemical Studies of Radionuclide Contaminated Surface Films on Metals and the Mechanism of their Formation and Dissolution | 0 | 0 | 0 | 1 |

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|--|---|---|---|---|
| 59925 - Modeling of Diffusion of Plutonium in Other Metals and of Gaseous Species in Plutonium-Based Systems | 0 | 1 | 0 | 2 |
| 64896 - Decontamination of Radionuclides from Concrete During and After Thermal Treatment | 0 | 1 | 0 | 0 |
| 64946 - Mechanisms of Radionuclide-Hydroxycarboxylic Acid Interactions for Decontamination of Metallic | 2 | 2 | 1 | 0 |
| 73835(Renewal of Project No.54914) - Atmospheric-Pressure Plasma Cleaning of Contaminated Surfaces | 0 | 3 | 0 | 2 |

Separations Chemistry

| <i>Project Number & Title</i> | <i>Undergrads</i> | <i>Masters</i> | <i>Ph.D.s</i> | <i>Post Docs</i> |
|--|--------------------------|-----------------------|----------------------|-------------------------|
| 60041 - Removal of Radioactive Cations and Anions from Polluted Water Using Ligand-Modified Colloid-Enhanced Ultrafiltration | 0 | 2 | 0 | 1 |
| 60283 - Waste Volume Reduction Using Surface Characterization and Decontamination by Laser Ablation | 0 | 0 | 0 | 2 |
| 64912 - Improved Decontamination: Interfacial, Transport, and Chemical Properties of Aqueous Surfactant Cleaners | 3 | 1 | 0 | 0 |
| 64965 - Supercritical Carbon Dioxide-Soluble Ligands for Extracting Actinide Metal Ions from Porous Solids | 0 | 4 | 0 | 0 |

HEALTH/ECOLOGY/RISK

Analytical Chemistry & Instrumentation

| <i>Project Number & Title</i> | <i>Undergrads</i> | <i>Masters</i> | <i>Ph.D.s</i> | <i>Post Docs</i> |
|--|--------------------------|-----------------------|----------------------|-------------------------|
| 60163 - Investigation of Techniques to Improve Continuous Air Monitors Under Conditions of High Dust Loading in Environmental Settings | 0 | 1 | 0 | 0 |

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| 73807(Renewal of Project No.60218) - Rapid Nucleic Acid Analysis for Contaminant Evaluation | 0 | 2 | 0 | 0 |
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Biogeochemistry

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 60015 - Long-term Risk from Actinides in the Environment: Modes of Mobility | 0 | 2 | 0 | 0 |

Health/Risk

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|---|-------------------|----------------|---------------|------------------|
| 54546 - Engineered Antibodies for Monitoring of Polynuclear Aromatic Hydrocarbons | 0 | 3 | 0 | 3 |
| 54584 - Comparison of the Bioavailability of Elemental Waste Laden Soils Using in vivo and in vitro Analytical Methodology, and Refinement of Exposure/Dose Models | 0 | 0 | 2 | 2 |
| 54684 - Mechanism Involved in Trichloroethylene-Induced Liver Cancer: Importance to Environmental Cleanup | 0 | 5 | 0 | 0 |
| 54940 - Improved Risk Estimates for Carbon Tetrachloride | 1 | 0 | 0 | 0 |
| 55356 - Environmentally-Induced Malignancies: An In Vivo Model to Evaluate the Health Impact of Chemicals in Mixed Waste | 0 | 1 | 0 | 0 |
| 55410 - Determining Significant Endpoints for Ecological Risk Analysis | 0 | 0 | 1 | 1 |
| 73942(Renewal of Project No.59918) - Improved Radiation Dosimetry Risk Estimates to Facilitate Environmental Management of Plutonium Contaminated Sites | 0 | 0 | 0 | 1 |

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|--|---|---|---|---|
| 74050(Renewal of Project No.59882) - Measurement of Radon, Thoron, Isotopic Uranium and Thorium to Determine Occupational and Environmental Exposure at US DOE Fernald | 0 | 1 | 0 | 0 |
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Low Dose Radiation

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 69848 - Adaptive Response Against Spontaneous Neoplastic Transformation in vitro Induced by Ionizing Radiation | 1 | 0 | 0 | 0 |
| 69906 - Markers of the Low-Dose Radiation Response | 0 | 2 | 0 | 3 |
| 69938 - Biological Effects of LLIR and Normal Oxidative Damage: The Same or Different? | 0 | 1 | 0 | 0 |
| 69981 - Mechanisms of Enhanced Cell Killing at Low Doses: Implications for Radiation Risk | 0 | 1 | 0 | 0 |

HIGH-LEVEL WASTE

Actinide (Heavy Element) Chemistry

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|---|-------------------|----------------|---------------|------------------|
| 54595 - f-Element Ion Chelation in Highly Basic Media | 4 | 5 | 0 | 2 |
| 59977 - Synthesis and Characterization of Templated Ion Exchange Resins for the Selective Complexation of Actinide Ions | 0 | 4 | 0 | 0 |
| 73759(Renewal of Project No.54679) - Computational Design of Metal Ion Sequestering Agents | 0 | 3 | 0 | 8 |
| 81940(Renewal of Project No.65398) - Characterization of Actinides in Simulated Alkaline Tank Waste Sludges and Leach | 0 | 0 | 0 | 2 |

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| 81962(Renewal of Project No.65352) - Understanding the Chemistry of the Actinides in High Level Waste Tank Systems: The Impact of Temperature on Hydrolysis and Complexation with Organics | 1 | 1 | 0 | 2 |
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Analytical Chemistry & Instrumentation

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 55318 - Improved Analytical Characterization of Solid Waste Forms by Fundamental Development of Laser Ablation Technology | 0 | 1 | 0 | 1 |
| 65421 - Correlation of Chemisorption and Electronic Effects for Metal/Oxide Interfaces: Transducing Principles for Temperature- Programmed Gas Microsensors | 1 | 1 | 0 | 2 |
| 81924(Renewal of Project No.60217) - Optical and Microcantilever-Based Sensors for Real-Time In Situ Characterization of High-Level Waste | 0 | 0 | 0 | 2 |
| 81939(Renewal of Project No.65340) - Hybrid Micro-Electro-Mechanical Systems (MEMS) for Highly Reliable and Selective Characterization of Tank Waste | 0 | 1 | 4 | 1 |

Engineering Science

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|---|-------------------|----------------|---------------|------------------|
| 55294 - Superconducting Open-Gradient Magnetic Separation for the Pretreatment of Radioactive or Mixed Waste Vitrification Feeds | 12 | 0 | 0 | 0 |
| 60143 - Foaming in Radioactive Waste Treatment and Immobilization Processes | 0 | 2 | 0 | 1 |
| 60451 - Mechanics of Bubbles in Sludges and Slurries | 0 | 0 | 0 | 1 |
| 65328 - Electrically Driven Technologies for Radioactive Aerosol Abatement | 0 | 3 | 0 | 0 |

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| 65371 - Numerical Modeling of Mixing of Chemically Reacting, Non-Newtonian Slurry for Tank Waste Retrieval | 0 | 1 | 0 | 0 |
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| 73827(Renewal of Project No.54890) - Non-Invasive Diagnostics for Measuring Physical Properties and Processes in High Level Wastes | 0 | 3 | 0 | 1 |
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Geochemistry

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 60403 - Phase Chemistry of Tank Sludge Residual Components | 0 | 1 | 0 | 0 |

Geophysics

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 55141 - Imaging and Characterizing the Waste Materials Inside an Underground Storage Tank Using Seismic Normal Modes | 0 | 1 | 0 | 0 |

Inorganic Chemistry

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|---|-------------------|----------------|---------------|------------------|
| 54628 - Colloidal Agglomerates in Tank Sludge: Impact on Waste Processing | 0 | 0 | 0 | 3 |
| 54646 - Interfacial Radiolysis Effects in Tank Waste Speciation | 0 | 0 | 0 | 3 |
| 54765 - Enhanced Sludge Processing of HLW: Hydrothermal Oxidation of Chromium, Technetium, and Complexants by Nitrate | 4 | 5 | 0 | 1 |
| 54807 - Studies Related to Chemical Mechanisms of Gas Formation in Hanford High-Level Nuclear Wastes | 0 | 3 | 0 | 0 |
| 55137 - Investigation of Novel Electrode Materials for Electrochemically-Based Remediation of High- and Low-Level Mixed Wastes in the DOE Complex | 1 | 2 | 0 | 1 |

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| 73778(Renewal of Project No.60296) - Research Program to Investigate the Fundamental Chemistry of Technetium | 0 | 0 | 0 | 1 |
|--|---|---|---|---|

Materials Science

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|---|-------------------|----------------|---------------|------------------|
| 54773 - Microstructural Properties of High-Level Waste Concentrates and Gels with Raman and Infrared Spectroscopies | 3 | 0 | 0 | 1 |
| 54982 - Analysis of Surface Leaching Processes in Vitrified High-Level Nuclear Wastes Using In-Situ Raman Imaging and Atomistic Modeling | 5 | 0 | 3 | 0 |
| 73750(Renewal of Project No.54672) - Radiation Effects in Nuclear Waste Materials | 0 | 0 | 0 | 5 |
| 73976(Renewal of Project No.55110) - Iron Phosphate Glasses: An Alternative for Vitrifying Certain Nuclear Wastes | 3 | 0 | 2 | 0 |
| 81934(Renewal of Project No.60020) - Stability of High-Level Waste Radioactive Waste Forms | 0 | 0 | 0 | 1 |

Separations Chemistry

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 54716 - Polyoxometalates for Radioactive Waste Treatment | 1 | 2 | 0 | 2 |
| 54996 - Ionizing Radiation Induced Catalysis on Metal Oxide Particles | 0 | 0 | 0 | 1 |
| 59990 - Fundamental Chemistry, Characterization, and Separation of Technetium Complexes in Hanford Waste | 0 | 0 | 0 | 1 |
| 59993 - Dynamic Effects of Tank Waste Aging on Radionuclide-Complexant Interactions | 0 | 1 | 0 | 0 |

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| 60017 - Removal of Technetium, Carbon Tetrachloride, and Metals from DOE Properties | 0 | 3 | 0 | 0 |
| 60050 - Chemical Speciation of Inorganic Compounds under Hydrothermal Conditions | 0 | 3 | 0 | 0 |
| 60123 - Potential-Modulated Intercalation of Alkali Cations into Metal Hexacyanoferrate Coated Electrodes | 2 | 2 | 0 | 0 |
| 73803(Renewal of Project No.55087) - Next Generation Extractants for Cesium Separation from High-Level Waste: From Fundamental Concepts to Site Implementation | 0 | 1 | 0 | 2 |
| 73824(Renewal of Project No.59982) - Reactivity of Peroxynitrite: Implications for Hanford Waste Management and Remediation | 0 | 1 | 0 | 1 |
| 74019(Renewal of Project No.54864) - Supramolecular Chemistry of Selective Anion Recognition for Anions of Environmental Relevance | 0 | 4 | 0 | 0 |
| 81912(Renewal of Project No.65409) - Electroactive Materials for Anion Separation - Technetium from Nitrate | 0 | 2 | 0 | 0 |
| 81935(Renewal of Project No.65339) - Ion Recognition Approach to Volume Reduction of Alkaline Tank Waste by Separation of Sodium Salts | 0 | 2 | 0 | 7 |

MIXED WASTE

Actinide (Heavy Element) Chemistry

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 60370 - Rational Design of Metal Ion Sequestering Agents | 0 | 3 | 0 | 3 |

Analytical Chemistry & Instrumentation

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|---|-------------------|----------------|---------------|------------------|
| 55171 - Development of Advanced In Situ Techniques for Chemistry Monitoring and Corrosion Mitigation in SCWO Environments | 0 | 1 | 0 | 1 |
| 55247 - Ion and Molecule Sensors Using Molecular Recognition in Luminescent, Conductive Polymers | 0 | 1 | 0 | 9 |
| 60070 - The Development of Cavity Ringdown Spectroscopy as a Sensitive Continuous Emission Monitor for Metals | 0 | 1 | 0 | 0 |

Engineering Science

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 54973 - A Novel Energy-Efficient Plasma Chemical Process for the Destruction of Volatile Toxic Compounds | 0 | 1 | 0 | 1 |
| 60326 - Isolation of Metals from Liquid Wastes: Reactive Scavenging in Turbulent Thermal Reactors | 0 | 4 | 0 | 0 |

Inorganic Chemistry

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 54506 - Acid-Base Behavior in Hydrothermal Processing of Wastes | 0 | 1 | 3 | 2 |
| 54828 - Processing of High Level Waste: Spectroscopic Characterization of Redox Reactions in Supercritical Water | 7 | 0 | 0 | 0 |
| 55115 - The Adsorption and Reaction of Halogenated Volatile Organic Compounds (VOCs) on Metal Oxides | 0 | 1 | 0 | 3 |
| 55276 - Fundamental Chemistry and Thermodynamics of Hydrothermal Oxidation Processes | 0 | 0 | 0 | 1 |

Materials Science

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 55387 - Photooxidation of Organic Waste Using Semiconductor Nanoclusters | 0 | 0 | 0 | 2 |

Separations Chemistry

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|---|-------------------|----------------|---------------|------------------|
| 54571 - Removal of Heavy Metals and Organic Contaminants from Aqueous Streams by Novel Filtration Methods | 2 | 0 | 2 | 2 |
| 54770 - New Anion-Exchange Resins for Improved Separations of Nuclear Materials | 0 | 8 | 0 | 2 |
| 54847 - Photocatalytic and Chemical Oxidation of Organic Compounds in Supercritical Carbon Dioxide | 0 | 0 | 0 | 2 |
| 54942 - Spectroscopy, Modeling and Computation of Metal Chelate Solubility in Supercritical CO ₂ | 0 | 3 | 3 | 1 |
| 55103 - Utilization of Kinetic Isotope Effects for the Concentration of Tritium | 0 | 0 | 0 | 2 |
| 60096 - Rational Synthesis of Imprinted Organofunctional Sol-Gel Materials for Toxic Metal Separation | 0 | 6 | 0 | 1 |

NUCLEAR MATERIALS**Analytical Chemistry & Instrumentation**

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 60247 - Miniature Nuclear Magnetic Resonance Spectrometer for In-Situ and In-Process Analysis and Monitoring | 0 | 5 | 0 | 0 |

Engineering Science

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 60077 - Development of Nuclear Analysis Capabilities for DOE Waste Management Activities | 0 | 0 | 1 | 0 |

Materials Science

| <i>Project Number & Title</i> | <i>Undergrads</i> | <i>Masters</i> | <i>Ph.D.s</i> | <i>Post Docs</i> |
|---|-------------------|----------------|---------------|------------------|
| 55382 - Determination of Transmutation Effects in Crystalline Waste Forms | 0 | 1 | 0 | 1 |

SPENT NUCLEAR FUEL

Geochemistry

| <i>Project Number & Title</i> | <i>Undergrads</i> | <i>Masters</i> | <i>Ph.D.s</i> | <i>Post Docs</i> |
|---|-------------------|----------------|---------------|------------------|
| 73691(Renewal of Project No.59960) - Renewal of Direct Investigations of the Immobilization of Radionuclides in the Alteration Products of Spent Nuclear Fuel | 0 | 3 | 0 | 0 |

SUBSURFACE CONTAMINATION

Actinide (Heavy Element) Chemistry

| <i>Project Number & Title</i> | <i>Undergrads</i> | <i>Masters</i> | <i>Ph.D.s</i> | <i>Post Docs</i> |
|--|-------------------|----------------|---------------|------------------|
| 54893 - Research Program to Determine Redox Properties and Their Effects on Speciation and Mobility of Pu in DOE Wastes | 0 | 0 | 0 | 4 |
| 70035 - DNAPL Surface Chemistry: Its Impact on DNAPL Distribution in the Vadose Zone and its Manipulation to Enhance Remediation | 0 | 4 | 0 | 0 |
| 70050 - Novel Optical Detection Schemes for In-Situ Mapping of Volatile Organochlorides in the Vadose Zone | 0 | 4 | 0 | 0 |
| 70126 - Collaboration: Interfacial Soil Chemistry of Radionuclides in the Unsaturated Zone | 0 | 3 | 0 | 0 |
| 73819(Renewal of Project No.59996) - Plutonium Speciation, Solubilization, and Migration in Soils | 0 | 1 | 0 | 3 |

Analytical Chemistry & Instrumentation

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 54639 - Development of an In-Situ Microsensor for the Measurements of Chromium and Uranium in Groundwater at DOE Sites | 1 | 1 | 0 | 0 |
| 54698 - Rapid Mass Spectrometric DNA Diagnostics for Assessing Microbial Community Activity During Bioremediation | 2 | 0 | 0 | 0 |
| 55108 - Monitoring Genetic & Metabolic Potential for In Situ Bioremediation: Mass Spectrometry | 0 | 1 | 2 | 1 |
| 55205 - A Fundamental Study of Laser-Induced Breakdown Spectroscopy Using Fiber Optics for Remote Measurements of Trace Metals | 0 | 7 | 0 | 0 |
| 55328 - Novel Analytical Techniques Based on an Enhanced Electron Attachment Process | 0 | 1 | 0 | 0 |
| 70010(Renewal of Project No.54674) - Spectroelectrochemical Sensor for Technetium Applicable to the Vadose Zone | 3 | 2 | 7 | 0 |
| 70179 - Radionuclide Sensors for Water Monitoring | 0 | 3 | 0 | 0 |
| 73808(Renewal of Project No.60197) - Microsensors for In-Situ Chemical, Physical, & Radiological Characterization Mixed Waste | 0 | 5 | 0 | 0 |

Biogeochemistry

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|---|-------------------|----------------|---------------|------------------|
| 54790 - Microbial Mineral Transformations at the Fe(II)/Fe(III) Redox Boundary for Solid Phase Capture of Strontium and Other Metal/Radionuclide Contaminants | 0 | 3 | 0 | 3 |

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| 55388 - Stable Isotopic Investigations of In Situ Bioremediation of Chlorinated Organic Solvents | 2 | 1 | 0 | 1 |
| 70063(Renewal of Project No.54666) - Biodegradation of Chlorinated Solvents: Reactions Near DNAPL and Enzyme Function | 0 | 3 | 0 | 0 |
| 70165 - Integrated Field, Laboratory, and Modeling Studies to Determine the Effects of Linked Microbial and Physical Spatial Heterogeneity on Engineered Vadose Zone Bioremediation | 0 | 0 | 2 | 1 |
| 73914(Renewal of Project No.55164) - Reductive Immobilization of U(VI) in Fe(III) Oxide-Reducing Subsurface Sediments: Analysis of Coupled Microbial-Geochemical Processes in Experimental Reactive Transport Systems | 0 | 0 | 1 | 1 |

Engineering Science

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 55211 - Cavitational Hydrothermal Oxidation: A New Remediation Process | 0 | 0 | 1 | 1 |
| 70045 - Investigation of Pore-Scale Processes which Affect Soil Vapor Extraction | 0 | 2 | 0 | 1 |
| 70088 - Interfacial Reduction-Oxidation Mechanisms Governing Fate and Transport of Contaminants in the Vadose Zone | 0 | 0 | 0 | 2 |
| 73793(Renewal of Project No.55013) - Biofiltration of Volatile Pollutants: Solubility Effects | 0 | 1 | 0 | 0 |

Geochemistry

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|---|-------------------|----------------|---------------|------------------|
| 54548 - The Efficacy of Oxidative Coupling for Promoting In-Situ Immobilization of Hydroxylated Aromatics in Contaminated Soil and Sediment Systems | 5 | 3 | 3 | 2 |
| 54635 - Molecular-Level Process Governing the Interaction of Contaminants with Iron and Manganese Oxides | 0 | 0 | 2 | 4 |
| 54823 - Modeling of Cation Binding in Hydrated 2:1 Clay Minerals | 3 | 3 | 0 | 2 |
| 55014 - Kinetics and Mechanisms of Metal Retention/Release in Geochemical Processes in Soil | 10 | 0 | 1 | 1 |
| 55148 - Hydrologic and Geochemical Controls on the Transport of Radionuclides in Natural Undisturbed Arid Environments as Determined by Accelerator Mass Spectrometry | 0 | 0 | 0 | 1 |
| 70070 - Reactivity of Primary Soil Minerals and Secondary Precipitates Beneath Leaking Hanford Waste Tanks | 0 | 0 | 0 | 1 |
| 70081 - Immobilization of Radionuclides in the Hanford Vadose Zone by Incorporation in Solid Phases | 0 | 7 | 0 | 0 |
| 70121 - The Influence of Calcium Carbonate Grain Coatings on Contaminant Reactivity in Vadose Zone Sediments | 0 | 1 | 0 | 1 |
| 73745(Renewal of Project No.54585) - Permanganate Treatment of DNAPLs in Reactive Barriers and Source Zone Flooding Schemes | 0 | 3 | 0 | 2 |

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| 73775(Renewal of Project No.55396) - Colloid Genesis/Transport and Flow Pathway Alterations Resulting From Interactions of Highly Reactive Waste Solutions and Sediments in the Vadose Zone | 0 | 0 | 0 | 2 |
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Geophysics

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|---|-------------------|----------------|---------------|------------------|
| 54655 - Collaborative Research: Hydrogeological-Geophysical Methods for Subsurface Site Characterization | 0 | 6 | 0 | 1 |
| 55332 - A Hybrid Hydrologic-Geophysical Inverse Technique for the Assessment and Monitoring of Leachates in the Vadose Zone | 0 | 7 | 5 | 3 |
| 60162 - Enhancements to & Characterization of the Very Early Time Electromagnetic (VETEM) Prototype Instrument & Applications to Shallow Subsurface Imaging at Sites in the DOE Complex | 2 | 2 | 0 | 1 |
| 73776(Renewal of Project No.60328) - High Frequency Electromagnetic Impedance Measurements for Characterization, Monitoring, and Verification Efforts | 0 | 0 | 0 | 1 |
| 70012 - Complex Electrical Resistivity for Monitoring DNAPL Contamination | 0 | 1 | 0 | 0 |
| 70052 - Material Property Estimation for Direct Detection of DNAPL Using Integrated Ground-Penetrating Radar Velocity, Imaging, and Attribute Analysis | 0 | 1 | 0 | 0 |
| 70108(Renewal of Project No.55411) - Effects of Fluid Distribution on Measured Geophysical Properties for Partially Saturated, Shallow Subsurface Conditions | 3 | 1 | 0 | 0 |
| 70115(Renewal of Project No.54699) - The Use of Radar Methods to Determine Moisture Content in the Vadose Zone | 0 | 2 | 1 | 1 |

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| 73731(Renewal of Project No.60199) - Automating Shallow Seismic Imaging | 0 | 3 | 0 | 0 |
| 73830(Renewal of Project No.55218) - Seismic Surface-Wave Tomography of Waste Sites | 3 | 0 | 0 | 2 |
| 73962(Renewal of Project No.60115) - Advanced High Resolution Seismic Imaging, Material Properties Estimation and Full Wavefield Inversion for the Shallow Subsurface | 0 | 2 | 0 | 0 |

Health/Risk

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|--|-------------------|----------------|---------------|------------------|
| 55033 - Characterization of Chemically Modified Hyperthermophilic Enzymes for Chemical Syntheses and Bioremediation Reactions | 0 | 0 | 1 | 5 |

Hydrogeology

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|---|-------------------|----------------|---------------|------------------|
| 54576 - On the Inclusion of the Interfacial Area Between Phases in the Physical and Mathematical Description of Subsurface Multiphase Flow | 0 | 0 | 0 | 2 |
| 54888 - Manipulating Subsurface Colloids to Enhance Cleanups of DOE Waste | 0 | 2 | 0 | 1 |
| 55036 - Colloid Transport and Retention in Fractured Deposits | 0 | 5 | 0 | 1 |
| 55083 - Behavior of Dense, Immiscible Solvents in Fractured Clay-Rich Soils | 0 | 4 | 1 | 0 |
| 55359 - Chaotic-Dynamical Conceptual Model to Describe Fluid Flow and Contaminant Transport in a Fractured Vadose Zone | 7 | 2 | 2 | 1 |

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| 70135 - Colloid-Facilitated Transport of Radionuclides Through the Vadose Zone | 0 | 3 | 0 | 1 |
| 70149(Renewal of Project No.54950) - The Dynamics of Vadose Zone Transport: A Field and Modeling Study Using the Vadose Zone Observatory | 0 | 0 | 0 | 1 |
| 70187 - Quantifying Vadose Zone Flow and Transport Uncertainties Using a Unified, Hierarchical Approach | 0 | 0 | 0 | 1 |
| 73732(Renewal of Project No.54680) - Migration and Entrapment of DNAPLs in Heterogeneous Systems: Impact of Waste and Porous Medium Composition | 1 | 2 | 4 | 0 |
| 73812(Renewal of Project No.55395) - Physics of DNAPL Migrations and Remediation in the Presence of Heterogeneities | 3 | 0 | 1 | 0 |

Inorganic Chemistry

| <i>Project Number & Title</i> | <i>Undergrads</i> | <i>Masters</i> | <i>Ph.D.s</i> | <i>Post Docs</i> |
|---|--------------------------|-----------------------|----------------------|-------------------------|
| 55061 - Fundamental Studies of the Removal of Contaminants from Ground and Waste Waters via Reduction by Zero-Valent Metals | 0 | 6 | 0 | 0 |
| 55119 - Phase Equilibria Modification by Electric Fields | 1 | 1 | 3 | 2 |

Microbial Science

| <i>Project Number & Title</i> | <i>Undergrads</i> | <i>Masters</i> | <i>Ph.D.s</i> | <i>Post Docs</i> |
|---|--------------------------|-----------------------|----------------------|-------------------------|
| 54681 - Dynamics of Coupled Contaminant and Microbial Transport in Heterogeneous Porous Media | 0 | 3 | 0 | 2 |
| 55031 - Genetic Analysis of Stress Responses in Soil Bacteria for Enhanced Bioremediation of Mixed Contaminants | 2 | 1 | 0 | 2 |

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|--|---|---|---|---|
| 55105 - Complete Detoxification of Short Chain Chlorinated Aliphatics: Isolation of Halorespiring Organisms and Biochemical Studies of the Dehalogenating Enzyme Systems | 0 | 1 | 0 | 0 |
| 55416 - Control of Biologically Active Degradation Zones by Vertical Heterogeneity: Applications in Fractured Media | 0 | 0 | 3 | 2 |
| 59786 - Design and Construction of <i>Deinococcus radiodurans</i> for Biodegradation of Organic Toxins at Radioactive DOE Waste Sites | 0 | 1 | 1 | 2 |

Plant Science

| Project Number & Title | Undergrads | Masters | Ph.D.s | Post Docs |
|---|-------------------|----------------|---------------|------------------|
| 55097 - Heavy Metal Pumps in Plants | 0 | 0 | 1 | 0 |
| 55278 - Molecular Genetics of Metal Detoxification: Prospects for Phytoremediation | 0 | 0 | 1 | 4 |
| 60271 - Characterization of a New Family of Metal Transport Proteins | 0 | 3 | 0 | 0 |
| 70054(Renewal of Project No.54837) - Phytoremediation of Ionic and Methyl Mercury Pollution | 0 | 4 | 0 | 1 |
| 73843(Renewal of Project No.55118) - Mechanisms of Heavy Metal Sequestration in Soils: Plant-Microbe Interactions and Organic Matter Aging | 0 | 0 | 0 | 3 |
| 73858(Renewal of Project No.54889) - Chlorinated Hydrocarbon Degradation in Plants: Mechanisms and Enhancement of Phytoremediation of Groundwater Contamination | 0 | 2 | 0 | 2 |

Separations Chemistry

Project Number & Title

54122 - A Broad Spectrum Catalytic System
for Removal of Toxic Organics from Water
By Deep Oxidation

Undergrads Masters Ph.D.s Post Docs

0 2 0 1



EMSP Researcher works with a trickling biofilter that removes dulite organics for contaminated air streams. [see Project #73793, renewal of #55013]



Phase equilibria and interfacial transport may be modified to enhance separations by applying an electric field. A vapor-liquid-equilibrium experiment is shown here. [see Project #55119]

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